

Properties of Parallel Lines

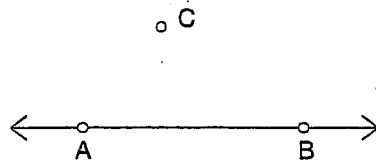
Name(s): _____

In this investigation, you'll discover relationships among the angles formed when parallel lines are intersected by a third line, called a *transversal*.

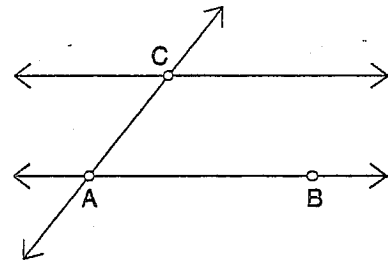
Sketch and Investigate

Select the line and the point; then, in the Construct menu, choose **Parallel Line**.

1. Construct \overleftrightarrow{AB} and point C , not on \overleftrightarrow{AB} .
2. Construct a line parallel to \overleftrightarrow{AB} through point C .
3. Construct \overleftrightarrow{CA} . Drag points C and A to make sure the three lines are attached at those points.



Step 1

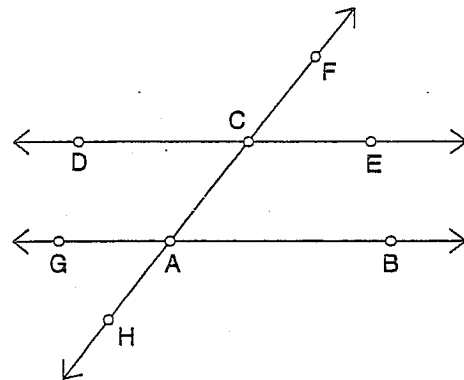


Steps 2 and 3

Using the **Text** tool, click once on a point to show its label. Double-click the label to change it.

To measure an angle, select three points, with the vertex your middle selection. Then, in the Measure menu, choose **Angle**.

4. Construct points $D, E, F, G,$ and H as shown at right.
5. Measure the eight angles in your figure. Be systematic about your measuring to be sure you don't measure the same angle twice.
6. Drag point A or B and see which angles stay congruent. Also drag the transversal \overleftrightarrow{CA} . (Be careful not to change the point order on your lines. That would change some angles into other angles.) Observe how many of the eight angles you measured appear to be always congruent.



Step 4

Q1 When two parallel lines are crossed by a transversal, the pairs of angles formed have specific names and properties. The chart on the next page shows one example of each type of angle pair. Fill in the chart with a second angle pair of each type, then state what relationship, if any, you observe between the angles in a pair type.

Properties of Parallel Lines (continued)

Angle Type	Pair 1	Pair 2	Relationship
Corresponding	$\angle FCE$ and $\angle CAB$		
Alternate interior	$\angle ECA$ and $\angle CAG$		
Alternate exterior	$\angle FCE$ and $\angle HAG$		
Same-side interior	$\angle ECA$ and $\angle BAC$		
Same-side exterior	$\angle FCD$ and $\angle HAG$		

Q2 One of the angle types has more than one pair. Name that angle type in the chart below, and name the third and fourth pairs of angles of that type.

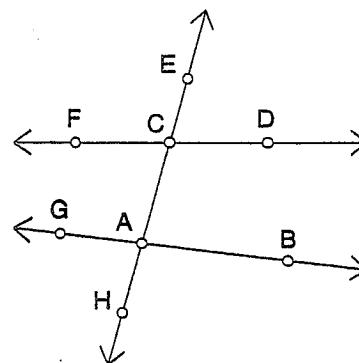
Angle Type	Pair 3	Pair 4	Relationship

7. Next, you'll investigate the converses of your conjectures. In a new sketch, draw two lines that are not quite parallel. Construct a transversal.

8. Add points as needed, then measure all eight angles formed by the three lines.

9. Move the lines until you have two sets of four congruent angles.

Q3 If two lines are crossed by a transversal so that corresponding angles, alternate interior angles, and alternate exterior angles are congruent, what can you say about the lines?



Explore More

1. You can use the converse of the parallel-lines conjecture to construct parallel lines. Construct a pair of intersecting lines \overleftrightarrow{AB} and \overleftrightarrow{AC} as shown. Select, in order, points C, A, and B. Then, in the Transform menu, choose **Mark Angle**. Double-click point C to mark it as a center for rotation. You figure out the rest. Explain why this method works.

